

I claim as my invention:

1 1. A heat transfer apparatus, comprising:

2 a heat source having a heat source maximum operating
3 temperature;

4 and a heat sink comprising a closed chamber having a chamber
5 first end wall, a chamber second end wall and a circumferential
6 chamber side wall interconnecting said chamber first end wall and
7 said chamber second end wall, said walls defining a chamber
8 interior space, at least one of said chamber first end wall and
9 said chamber second end wall being a heat transfer wall, a heat
10 transfer material retained within said chamber, and at least one
11 impeller having an axis of impeller rotation and an impeller radius
12 mounted within said chamber adjacent to said heat source to rotate
13 about the axis of impeller rotation for moving the heat transfer
14 material over said heat transfer wall and propelling said heat
15 transfer material to a location thermally remote from said heat
16 source for heat dissipation, wherein said chamber interior space
17 extends perpendicular to the axis of impeller rotation a radial
18 thermal spacing distance of at least two times the impeller radius.

19 2. The heat transfer apparatus of claim 1, wherein said heat
20 transfer material is one of: a liquid; a liquid-in-liquid emulsion;
21 a liquid-vapor mixture; a solid-in-liquid suspension and a phase
22 change material-in-liquid suspension.

1 3. The heat transfer apparatus of claim 1, wherein said
2 chamber contains a conductive porous structure.

1 4. The heat transfer apparatus of claim 1, comprising at
2 least two said impellers, said impellers operating and being
3 controlled independently of each other.

1 5. The heat transfer apparatus of claim 1, wherein at least
2 one of: said chamber first end wall, said chamber second end wall
3 and said circumferential chamber side wall, comprises at least one
4 heat fin.

1 6. The heat transfer apparatus of claim 1, wherein said heat
2 transfer wall one of: in thermal contact with said heat source and
3 comprises at least a portion of heat source.

1 7. A heat transfer apparatus, comprising:

2 a heat source having a heat source maximum operating
3 temperature;

4 and a heat sink comprising a closed chamber having a chamber
5 first end wall, a chamber second end wall and a circumferential
6 chamber side wall interconnecting said chamber first end wall and
7 said chamber second end wall, said walls defining a chamber
8 interior space, at least one of said chamber first end wall and
9 said chamber second end wall being a heat transfer wall in thermal
10 contact with the heat source, a phase change heat transfer material
11 retained within said chamber, and at least one impeller having an
12 axis of impeller rotation and an impeller radius mounted within
13 said chamber adjacent to said heat source to rotate about the axis
14 of impeller rotation for moving any said phase change material in
15 its liquid phase over said heat transfer wall and propelling said
16 heat transfer material to a location thermally remote from said
17 heat source for heat dissipation.

1 8. The heat transfer apparatus of claim 7, wherein said
2 chamber contains a conductive porous structure.

1 9. The heat transfer apparatus of claim 7, comprising at
2 least two said impellers, said impellers operating and being
3 controlled independently of each other.

1 10. The heat transfer apparatus of claim 7, wherein at least
2 one of: said chamber first end wall, said chamber second end wall
3 and said circumferential chamber side wall, comprises at least one
4 heat fin.

1 11. The heat transfer apparatus of claim 7, wherein said heat
2 transfer wall one of: is in thermal contact with said heat source
3 and comprises at least a portion of heat source.

1 12. A heat transfer apparatus, comprising:
2 a heat source having a heat source maximum operating
3 temperature;

4 and a heat sink comprising a chamber having a chamber first
5 end wall, a chamber second end wall and a circumferential chamber
6 side wall interconnecting said chamber first end wall and said
7 chamber second end wall, said walls defining a chamber interior
8 space, at least one of said chamber first end wall and said chamber
9 second end wall being a heat transfer wall in thermal contact with
10 the heat source, a heat transfer material retained within said
11 chamber, and at least one impeller having an axis of impeller
12 rotation and an impeller radius mounted within said chamber
13 adjacent to the heat source to rotate about the axis of impeller
14 rotation for moving the material over the heat transfer wall and
15 propelling said material to a heat exchange region that is external
16 to the said chamber.

1 13. The heat transfer apparatus of claim 12, wherein said
2 chamber contains a conductive porous structure.

1 14. The heat transfer apparatus of claim 12, comprising at
2 least two said impellers, said impellers operating and controlled
3 independently of each other.

1 15. The heat transfer apparatus of claim 12, wherein at least
2 one of: said chamber first end wall, said chamber second end wall
3 and said circumferential chamber side wall, has at least one heat
4 fin.

1 16. The heat transfer apparatus of claim 12, wherein said
2 heat transfer wall one of: in thermal contact with said heat source
3 and comprises at least a portion of heat source.

1 17. The heat transfer apparatus of claim 12, wherein said
2 heat transfer material is one of: a liquid; a liquid-in-liquid
3 emulsion; a liquid-vapor mixture; a solid-in-liquid suspension and
4 a phase change material-in-liquid suspension.

1 18. A heat transfer apparatus, comprising:
2 a heat source having a heat source maximum operating
3 temperature;
4 and a heat sink comprising a closed chamber having a chamber
5 first end wall, a chamber second end wall and a circumferential
6 chamber side wall interconnecting said chamber first end wall and
7 said chamber second end wall, said walls defining a chamber
8 interior space, said circumferential chamber side wall being a heat
9 transfer wall in thermal contact with the heat source; a heat
10 transfer material retained within said chamber, said heat transfer
11 material being one of: a liquid; a liquid-in-liquid emulsion; a
12 liquid-vapor mixture, a solid-in-liquid suspension, a phase change
13 material, and a phase change material-in-liquid suspension; and at
14 least one impeller having an axis of impeller rotation and an
15 impeller radius mounted within said chamber to rotate about the
16 axis of impeller rotation for moving any said heat transfer
17 material in its liquid phase over said heat transfer wall for heat
18 dissipation.

1 19. The heat transfer apparatus of claim 18, wherein said
2 chamber contains a conductive porous structure.

1 20. The heat transfer apparatus of claim 18, comprising at
2 least two said impellers, said impellers operating and controlled
3 independently of each other.